Bonded Capillary Columns

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The sol gel process has been widely used in a variety of areas including high-performance chromatography, materials science, and nanotechnology applications.

The sol gel technology has been applied for the in situ formation of stationary phases on fused-silica capillary columns. Experience suggests that the sol gel method will provide a better avenue for preparing analytical microcolumns for miniaturized instruments. These microcolumns have the potential to be used for fast and highly efficient separation and analysis of polar as well as nonpolar compounds in future planetary spacecraft missions that will focus on in situ or returned samples analysis. The sol gel process is not a well-defined preparation procedure. Usually, it has to be modified according to the components involved. Therefore, studies of the effects of solvents were conducted, and some particular formulations were found to be excellent for the preparation of columns.

In order to further advance the sol gel process for column preparation in a more definitive and effective way, a more systematic study will be carried out to further resolve this problem. Accordingly, several short (about 10-feet-long) gas chromatography (GC) columns have been prepared. Some of these displayed desirable properties for analytical gas chromatography of small polar and nonpolar molecules (see figure).

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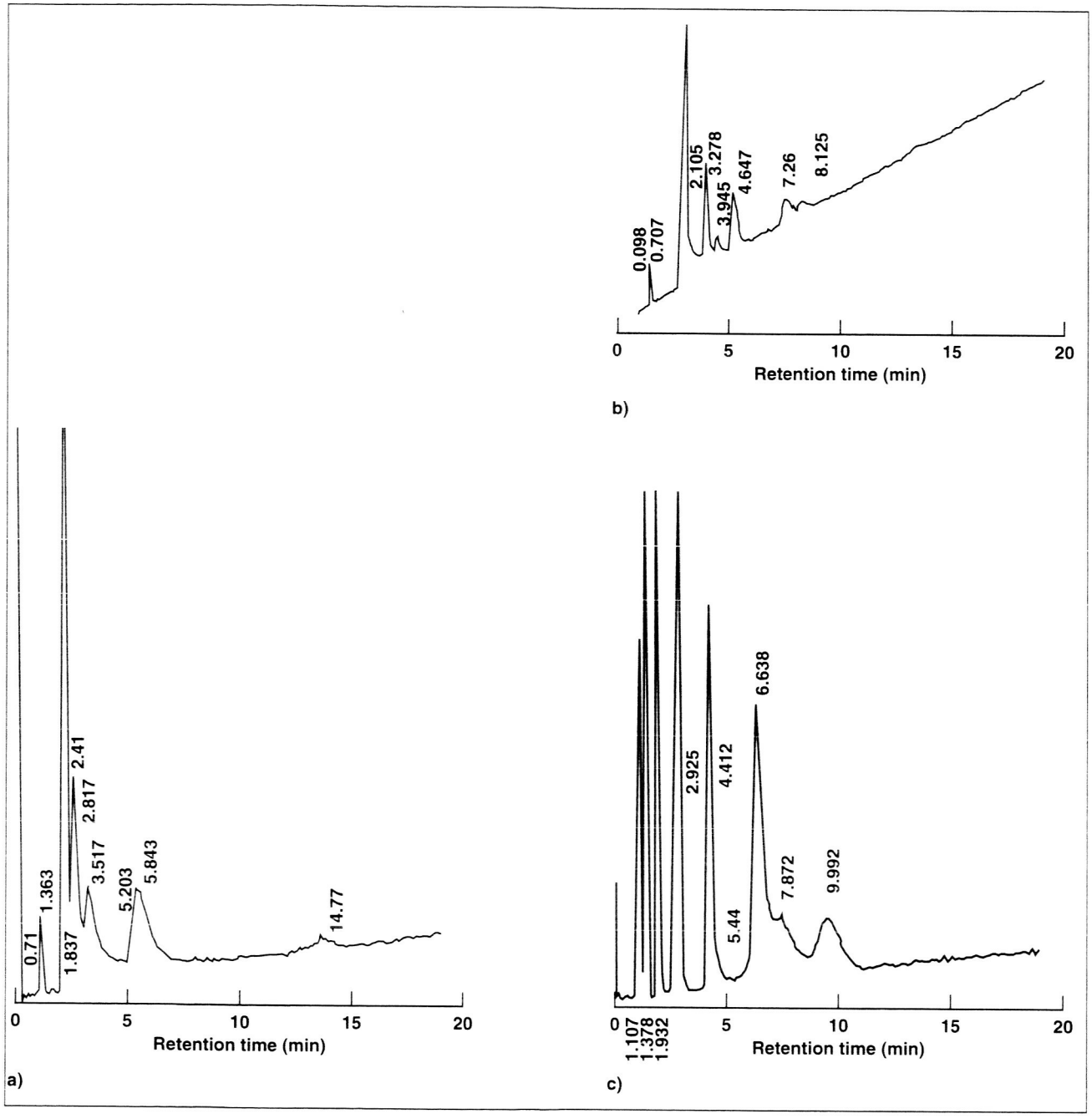

Fig. 1. Chromatographic data based on a 10-foot-long cyanoethyl-containing fused-silica capillary column with inner diameter of 0.530 millimeter. (a) The GC analysis of a mixture of seven amines was run at a flow rate of 1 milliliter per minute of helium at 129° C. (b) The GC analysis of a mixture of six alcohols was run at 3 milliliters per minute of helium at 100° C. (c) The GC analysis of a mixture of 10 hydrocarbons was run at 1 milliliter per minute of helium at 20° C.